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(58) Field of Search

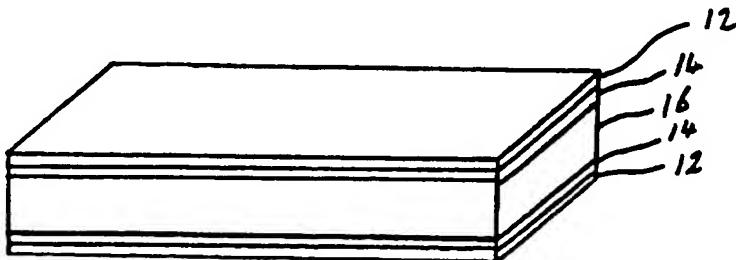
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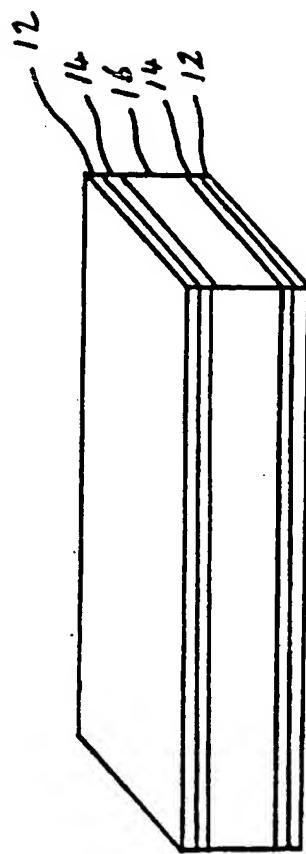
Online:WPI

(54) Composite wood panel

(57) A composite wood panel includes a plurality of wood layers (12, 16) formed from medium density tropical hardwoods and one or more metal layers (14). Sheets of thermosetting phenolic adhesive interleave the wood and metal layers (12-16). The assembled board has considerably higher strength and less weight than corresponding wood boards.



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## COMPOSITE WOOD PANEL

The present invention relates to a composite wood panel and to a method of producing such a panel.

Composite wood panels have been used for some time in applications which require high strength and durability. 5 However, in cases where the panelling is to be subjected to large stresses and wear, such as in railway carriage applications and the like, the panelling must be thick to provide reasonable performance. Thick panelling has inherent 10 disadvantages of high weight and large volume.

The present invention seeks to provide improved wood panelling.

15 According to an aspect of the present invention, there is provided, a composite wood panel comprising a plurality of wood veneer layers and one or more metal layers, at least one of the wood layers being formed from a medium density tropical hardwood or similar wood. Preferably all the wood 20 layers are formed from a medium density tropical hardwood or similar wood. Other species of wood may be used in applications which do not require chemical impregnation before manufacture of the panel.

25 According to another aspect of the present invention, there is provided a method of producing a composite wood panel including the steps of forming a balanced assembly of layers and binding the assembly under high heat and pressure.

30 According to another aspect of the present invention, there is provided a method of producing a composite wood panel including the steps of forming a balanced assembly of layers and interleaving the layers with sheets of phenolic thermosetting adhesive.

35

The preferred embodiment provides a composite structural panel which can combine the advantages of medium density wood

fibre, metals, chemicals and phenolics to provide a panel with additional strength, stability and durability, and which has improved thermal/heat reflection insulation properties, and including improved sound insulation. By reducing the 5 thickness of individual veneer layers and the quantity of metal and chemicals, the panel can be made light-weight and approximately twice the strength of equivalent base panels without reinforcement.

10 The panel is preferably fire and rot-proof treated to improve its properties and durability.

15 Typical applications for the panel include internal walls, bulkheads, ceilings, body side linings, seats, doors and floors and external doors for railway carriages and locomotives and also for other public transport vehicles such as buses and the like.

20 An embodiment of the present invention is described below, by way of example only, with reference to the accompanying drawing, in which the sole Figure is a cross-sectional view 25 of an embodiment of composite wood board.

Referring to the Figure, the embodiment of panel shown is 25 formed of five layers, four of which can be said to be matching layers. The relative thicknesses of the layers will vary in dependence upon the application and will vary from the indications given in the Figure.

30 The central layer 16 is a wood veneer layer which may be formed from a single sheet of veneer or from a plurality of sheets, in accordance with requirements for the application in question. The preferred veneer is obtained from medium density tropical hardwoods, for example of mahogany type, or 35 from similar woods. Woods from Africa and South America have been found to have the most desirable properties. The preferred woods are of medium density of certain texture so

as to have reasonable flexibility and have relatively short grain. This combination retains the flexibility of the panel and facilitates impregnation of the wood with phenolic adhesive, fire retardants, rot-proofing chemicals, as is  
5 described in further detail below.

Each veneer layer preferably has a thickness of between 1.2 millimetres and 3.2 millimetres. The metal layers 14 may have similar thicknesses.

10

The preferred woods have a density preferably between 600 kg/m<sup>3</sup> and 670 kg/m<sup>3</sup> (between 38 and 42 lb/ft<sup>3</sup>), although woods with a density between 560 kg/m<sup>3</sup> and 720 kg/m<sup>3</sup> (between 35 and 45 lb/ft<sup>3</sup>) could also be used. These figures are  
15 given at 12% moisture content.

Each side of the central layer 16 is covered by a thin metal layer 14 of, for example, aluminium, stainless steel, copper or the like. The metal layers 14 are in turn covered by wood  
20 veneer outer layers 12 which may or may not be of the same wood as the central layer 16, in dependence upon the application.

The metal layers 14 can also be applied on the exterior  
25 surfaces of the panel or in certain applications in an unbalanced construction with a metal layer 14 exposed on one surface and the opposite side metal layer 14 overlaid by veneer to allow for bonding of other surface materials, decorative laminates or other layers. Also for the purposes  
30 of applying sound proofing suitable chemicals may be bonded or sprayed on the wood veneer surface on one side thereof.

The metal layers 16 and the wood layers 12, 16 are substantially matched for flexibility such that the wood  
35 layers 12, 16 can retain the flexibility of the metal layers 14 in expansion and contraction.

The strength and integrity of the panel is obtained by careful manufacture. In the preferred embodiment, after careful selection of the raw wood, which is of the type mentioned above, veneers are produced by cutting on the basis  
5 of a loosely rotary cut. The cutting knife is preferably set at an angle to separate the wood fibres slightly, which enhances flexibility of the veneer, and absorption of adhesives such as phenolic adhesives and impregnation of fire retardant and rot-proofing chemicals, thereby bonding of the  
10 various layers to one another. All of the veneer layers of the panel are preferably produced in this manner.

The veneer layers are then pressure impregnated with chemicals either in the body or glue-line of the veneer so  
15 as to rot-proof and fire-proof the wood. The preferred fire retardant properties are ignition "nil" and "nil" spread of flame for up to 20 minutes, which would meet the specifications for public transport vehicles.

20 The thin metallic sheets 14 are then assembled under the face veneer layers 12, each layer being interlaid with a thermosetting adhesive, preferably a phenolic thermosetting impregnated paper adhesive. This adhesive is produced in the form of thin flexible sheets which have the appearance of  
25 Bakelite (TM) and can be rolled onto the veneer layers and pressed onto them at high temperatures for bonding.

Alternatively, thin metallic sheets 14 or decorative and plain finish melamine laminates can be provided on the outer  
30 face of the panel for particular exterior finishes.

In the preferred embodiment, the layers of the panel are in balance through the panel, that is symmetrical about the central plane of the panel, to maintain equal stresses on  
35 each side, both during and after manufacture.

The assembled layers are then loaded into hot presses and

compressed at a pressure of, for example, around 1.7 bar (around 250 psi) at a temperature preferably not less than around 137°C (around 280°F) and most preferably between around 137°C to around 149°C (around 280 to around 300°F).

5

The adhesive forms a gel and is fused into the fibres of the veneer layers, while the paper carrier acts as a web to assist in binding the layers together. At the same time, the adhesive bonds the metal layers 14 under the extreme heat and 10 pressure of the presses all in one operation.

Adhesive impregnation, hence binding, can be improved by ensuring that the veneers have a moisture content of not less than about 6% and not more than about 8%.

15

In order to maintain even strength across the whole of a panel, should the size of the panel be too large to be able to be made from single sheets of material for each layer, a plurality of sheets are used but without scarf joints. 20 Splice joints are preferably used.

The thermosetting phenol impregnated paper adhesive used in the preferred embodiment provides fire retardant qualities to the panel and is thus advantageously also to be used as 25 a covering over the outer veneer layers 12. It can also serve as a finishing product for the panel, to receive by exterior application, painted or glued, other materials such as rubber or vinyl, floor covering for railway carriages, locomotives and buses.

30

Where other exterior finishes are desired and liquid adhesives are applied to secure the bonding of plain finish or decorative laminates unsuitable for hot thermosetting bonding, the outer veneers of the panel are left exposed as 35 raw-wood fibre to provide a key for bonding purposes.

Before application and fixing of the manufactured panel, all

edges and holes are sealed with water repellent preservative liquid to prevent absorption of moisture and weakening of wood fibre.

CLAIMS

1. A composite wood panel comprising a plurality of wood veneer layers and one or more metal layers, at least one of the wood layers being formed from a medium density tropical hardwood or similar wood.
2. A panel according to claim 1, wherein all the wood layers are formed from a medium density tropical hardwood or similar wood.
3. A panel according to claim 1 or 2, wherein each wood layer has a thickness between 1.2 and 3.2 millimetres.
4. A panel according to any preceding claim, wherein each wood layer is formed from a wood having a density between 560 and 720 kg/m<sup>3</sup>, measured at 12% moisture content.
5. A panel according to claim 1, 2 or 3, wherein each wood layer is formed from a wood having a density between 600 and 670 kg/m<sup>3</sup>, measured at 12% moisture content.
6. A panel according to any preceding claim, wherein the metal layer or layers are formed of aluminium, stainless steel or copper.
7. A panel according to any preceding claim, comprising a thermosetting adhesive sheet bonding each pair of facing layers to one another.
8. A panel according to claim 7, wherein the thermosetting sheet is a phenolic adhesive sheet.
9. A method of producing a composite wood panel including the steps of forming a balanced assembly of layers and binding the assembly under high heat and pressure.

assembly under high heat and pressure.

10. A method of producing a composite wood panel including the steps of forming a balanced assembly of layers and interleaving the layers with sheets of phenolic thermosetting adhesive.

11. A method according to claim 9 or 10, comprising the step of forming the or each wood layer by a loosely rotary cut.

12. A method according to claim 11, wherein the or each wood layer is cut at an angle which separates the wood fibres at the surface of the wood layer.

13. A method according to any one of claims 9 to 12, wherein the assembled layers are treated in hot presses at a pressure of around 1.7 bar.

14. A method according to claim 13, wherein the assembled layers are treated in hot presses at a pressure not less than around 137°C.

15. A method according to claim 13 or 14, wherein the assembled layers are treated in hot presses at a pressure between 137°C and 149°C.

16. A composite wood panel substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

17. A method of forming a composite wood panel substantially as hereinbefore described with reference to the accompanying drawing.



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Application No: GB 9611554.8  
Claims searched: 1-8,16

Examiner: Dave Butters  
Date of search: 13 September 1996

**Patents Act 1977**  
**Amended Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.O): B5L, B5N

Int CI (Ed.6): B27D, B32B

Other: Online: WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	GB 1460570 A ( LASER ENGINEERING )(Whole doc')	1-8
X	GB 1043851 A ( UNION CARBIDE )(See Example 76)	1,2,3,6
X	GB 0433824 A ( VENESTA )(Whole document)	1-5

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.